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CONTROL DEVICE FOR A FUME EXTRACTION DEVICE

The present invention relates to a fume extraction device and a method for controlling a fume extraction device.

Fume extraction devices are preferably used in kitchens above a cooking hob in order to remove air laden with fumes and steam away from the cooking hob. In this case, a distinction is made between circulating-air hoods which extract air at the cooking hob, filter it and return it to the room, and waste air hoods which extract the air, filter it and convey it outside into the open.

If a waste-air hood is operated in a room with an open fireplace, there is the risk that the waste gases produced at the fireplace will be sucked into the room. In order to avoid this, numerous solutions have been proposed in the prior art.

DE 100 28 333 A1 discloses a safety radio circuit layout for a waste air-fume extraction hood where the fume extraction hood is switched off when it is determined that an air inlet flap or another air inlet opening such as a window or a door is closed. The transmission as to whether such an air inlet flap, a window or a door is closed is accomplished by radio.

DE 30 40 051 A1 discloses a control device for a waste-air - circulating-air fume extraction hood wherein the waste air or the circulating air is controlled depending on the pressure of the room air.

JP 081 70 846 A discloses a fume extraction hood where a pressure sensor is provided in the waste-air channel. If the pressure of the waste air falls below a pre-

determined value, a control system deduces that a window or a door of the kitchen is not opened, whereupon an air intake fan is set in motion to supply air into the kitchen so that an excessive underpressure is avoided in the kitchen.

JP 063 47 081 A discloses an air inlet and exhaust system comprising a fume extraction hood where the inlet air is controlled by means of an air inlet throttle valve to avoid an underpressure in the kitchen.

DE 92 08 818 U1 discloses a fume extraction hood for a kitchen comprising a waste air channel and a circulating air channel which are interconnected by means of a throttle. If the pressure in the kitchen falls too steeply, waste air flows directly into the circulating air channel via the throttle and thus back into the kitchen.

DE 910 10 95 U1 discloses a fume extraction device comprising a volume flow rate measuring device which detects by means of the pressure difference between the extraction connection and the environment of the extraction hood and determines therefrom the air volume flow rate through the extraction hood. The device monitors the air flow through the extraction and warns the user audibly and visually if the air volume flow rate falls below or goes above air volume flow rate limits which would result in an unsafe operating state of the extraction hood.

DE 39 25 975 C2 discloses a switch-over device for selective circulating-air or waste-air operation of a fume extraction hood where a switch-over unit is automatically actuated by means of a control device which detects chimney-bound heating devices in the

operating state so that when a heater is operating, the fume extraction hood is switched over to circulating air operation. The switch-over unit can be a driven flap for example.

DE 17 81 986 U1 discloses an air flap for fans built into rooms where oil furnaces are located where a room-ventilating flap is provided which is opened to ventilate the room when the fan is started up.

These solutions described in the prior art are unsatisfactory because they are mostly too expensive.

It is the object of the present invention to provide a fume extraction device and a method for operating a fume extraction device wherein reliable operation of the fume extraction device in a room with an open fireplace is functionally safe and can be accomplished in a simple fashion.

This object is solved by the features of claims 1 or 2 or 12.

Since a control device which can be used in a fume extraction device comprising a fan, located in a room, comprises a pressure difference detection device for detecting the pressure difference between the inside pressure in the room and the outside pressure in the area outside the room and a control device for recording the air conveying capacity of the fume extraction device depending on the detected pressure difference, it is possible to reduce the air conveying volume if the underpressure in the room becomes hazardous if an open fireplace is operated in the room.

Measurement of the pressure difference between inside pressure in the room and outside pressure in the area

outside the room into which the fume extraction device conveys the waste air has the advantage that a balance between inside pressure in the room and outside pressure outside the room is always made independently of air pressure fluctuations accompanying changes in weather or independently of the height of the installation location. That is, the control device or the fume extraction device provided with such a control device functions safely and reliably at any installation location without the need to undertake any calibration or subsequent adjustment.

In addition, this measuring device is very simple and therefore inexpensive. In an advantageous embodiment of the invention, the pressure difference detection device has an inside pressure sensor and an outside pressure sensor and a comparator device to compare the detected inside pressure and the detected outside pressure.

In an advantageous embodiment of the invention the pressure difference detection device has a first sensor line which is connected to the installation room and a second sensor line which is connected to the area outside the room.

In an advantageous embodiment of the invention the pressure difference detection device is preferably arranged in the room at the fume extraction device or in the area outside the room or partly in the room and partly in the area outside the room.

A very simple detection between inside pressure and outside pressure in the area outside the room can be made using the arrangements hereinbefore.

In an advantageous embodiment, the pressure difference detection device comprises a membrane which is

connected on one side by means of a first sensor line to the room and is connected on the other side by means of a second sensor line to the area outside the room. The membrane is thus acted upon by the pressure in the room on one side and by the pressure outside the room on the other side. This arrangement is especially simple and inexpensive especially if the first and/or the second sensor line is constructed as a hose line.

In an advantageous embodiment a duct is provided for guiding the fume-laden air into the area outside the room and the second sensor line is laid along or in the duct in the area outside the room. It is thereby possible to use for the second sensor line an already existing wall opening or an already existing duct for laying the sensor line.

In an advantageous embodiment the control device controls the fan such that, preferably in a control loop, the inside pressure with respect to the outside pressure does not fall below a pre-determined pressure difference threshold of preferably 4 Pascal or that the fan is switched off if the inside pressure with respect to the outside pressure falls below a pre-determined pressure difference threshold of preferably 4 Pascal and that the fan is switched on if the inside pressure with respect to the outside pressure increases above the pre-determined pressure difference threshold.

In an advantageous embodiment of the invention a warning signal issuing device is provided which issues a warning signal if the inside pressure falls below a pressure difference threshold of preferably 4 Pascal.

The output warning signal can be an audible warning signal preferably in the form of an interrupted warning tone and/or a visual signal preferably in the form of a

flashing red light and/or in the form of a display which indicates to the user "open window" or "ventilate room".

Further features and advantages of the invention are obtained from the following description of the exemplary embodiment with reference to the appended drawing.

Figure 1 shows a waste-air fume extraction device in a room.

According to the figure, the fume extraction device 1 has a housing 2, a fan 3 and a control device 4. The fume extraction device 1 is located in a room 5 with the inside pressure P_i above a cooking hob 6. The fume extraction device 1 conveys air laden with fumes and vapours via a duct 7 through a wall opening 8 into an area 9 outside the room 5 with an outside pressure P_a.

The control device 4 has a pressure difference detection device 10, a control device 11 for controlling the fan 3 depending on the pressure difference between the inside pressure P_i and the outside pressure P_a detected by the pressure difference detection device 10. Furthermore, the control device has a warning signal issuing device 12 which can emit a warning signal at a pre-determined pressure difference threshold between the inside pressure P_i and the outside pressure P_a.

The pressure difference detection device 10 has a pressure sensor, preferably embodied as a membrane which is connected on one side via a first sensor line 14 to the room 5 and is thus acted upon by the inside pressure P_i and on the other side is connected via the second sensor line 15 to the area 9 outside the room 5

and is acted upon by the outside pressure P_a. The first and the second sensor line 14 and 15 are constructed as flexible hose lines.

The pressure difference detection device 10 is able to detect the pressure difference between the room 5 which is at the pressure P_i and the pressure in the area outside the room 5 which is at the pressure P_a by means of the first sensor line 14 and the second sensor line 15. Since a fume extraction device extracts a large amount of air from the room 5, an underpressure is formed in this room 5 which has the result that the extracted air from the room 5 must flow back into the room 5 via gaps at doors and windows. If an open fireplace with a chimney is located in the room 5, there is a risk that smoke and exhaust gases from the open fireplace will be sucked back into the room 5 via the chimney as a result of the underpressure formed in the room 5. Experience has shown that there is a serious risk if the inside pressure P_i in the room is 4 Pascal lower than the outside pressure P_a in the area 9 outside the room 5 into which the fume extraction device conveys the waste air.

If the control device 4 receives the message from the pressure difference detection device 10 that the underpressure in the room 5 has fallen below the pressure difference threshold of 4 Pascal, the control device switches off the fan and issues a warning signal via the warning signal issuing device 12 so that a user, for example, a cook, opens a room ventilation device such as, for example, a window or a door. If the pressure difference detection device 10 detects that the underpressure in the room 5 has fallen below the pressure difference threshold of 4 Pascal again, the control device 4 switches the fan 3 on again. Alternatively to switching off the fan when the

pressure difference threshold of 4 Pascal is exceeded, the control device 4 can regulate the speed and therefore the quantity of air conveyed by the fan 3 so that the pressure difference threshold of 4 Pascal is not exceeded. In this way a certain amount of extraction, a so-called emergency operation of the fume extraction device can be maintained wherein the required safety is ensured at the same time.

A buzzer can be provided as a warning signal issuing device 12 which issues a warning tone, preferably an interrupted warning tone or a visual signal such as a flashing red light and/or a display which illuminates an instruction such as, for example, "ventilate room" or "open window" or the like.

The control device 4 which comprises the pressure difference detection device 10 and the control device 11 can be fitted as a unit in already existing fume extraction hood, in which case it is only necessary to lay a second sensor line 15 in the form of a hose through the duct 7 in the area 9 outside the room 5 and provide a corresponding electrical connection between the fan 3 and the control device 4.

Instead of the previously described membrane, the pressure difference detection device 10 for detecting the pressure difference P_d between the inside pressure P_i in the room 5 and the outside pressure in the area 9 outside the room 5 can comprise an inside pressure sensor (not shown) and an outside pressure sensor (not shown) and a comparator device for comparing the detected inside pressure and the detected outside pressure.